STATEMENT FOR THE RECORD

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BEFORE THE

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OCEAN DISPOSAL OF DREDGED MATERIAL

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Mr. Chairman and Members of the Committee:

I am Robert J. Pierce, a biologist with the Planning Division of the North Atlantic Division, Corps of Engineers. It is a pleasure to appear before you today, in this discussion of the risk to human health from ocean dumping of dredged spoil.

While the Corps recognizes the expertise and the lead of the Environmental Protection Agency and the Food and Drug Administration in these matters, we are concerned with and evaluate the effects on health and safety of the human population for all of our Congressionally authorized projects and in the public interest review of our regulatory program. Human health is of major concern in evaluating the effects of discharging dredged material into either ocean or inland waters or for that matter in upland areas. However, our concern for health extends beyond the human population and into the well being of the biotic communities inhabiting both freshwater and marine environments. It has been and remains our philosophy that by evaluating the effects of activities on the lower forms of life (eg. fish, clams, shrimp and worms) and by reasonably ensuring that our actions, either direct or through the permitting process, will not cause unacceptable adverse effects in these populations, we are applying a layer of "insulation" between the impacts of an activity and its effects on the health of the human population. In this regard it should be noted that my background is in fish physiology and aquatic ecology. I have never worked directly with the human health effects of PCB or any other contaminants. From this same standpoint, the Corps is not directly involved with establishing acceptable levels of risk to the human population of exposure to toxic contaminants.

Risk assessment at best is a very difficult and uncertain process. There are three levels of concern associated with it: 1) the effect of drugs and chemicals on humans; 2) the effects of discharges of these chemicals on the environment; and 3) the effects of discharging sediments contaminated with these chemicals. Even the costly and extensive drug research with its direct effects on human health is time-consuming, complicated and fraught with uncertainties. So much more so is assessment of the risk of discharging chemicals into the environment or the next step of evaluating the effects of discharging sediment-bound contaminants. In many cases, these sediment-bound contaminants have been affected by complicated geochemical processes and are greatly altered in structure, chemical characteristics and biological availability from the parent compound.

As a highly industrialized and technologically advanced society, we produce wastes in vast quantities that are both natural and synthetic, hazardous and innocuous. Control and disposal of these wastes has been and continues to be a serious problem. We are limited in our choice of disposal of wastes to one of three environments: land, water or air. To summarily reject any one of these options is to reduce our capabilities by at least one-third. To reject water is to handicap ourselves to a far greater extent since three-fourths of the globe is covered by water.

This nation and the world community needs to make immediate and major commitments to conservation, recovery and moderation in the use of its resources. Current awareness, legislation and these hearings themselves

are an important step in this direction. Unfortunately, our record of use including disposal of hazardous chemicals has been less than exemplary. We need to take corrective actions as well as plan for the future disposal of hazardous wastes. These are complicated problems and will require complicated solutions. Furthermore, we cannot expect reasonably to clean up the environment over night. This is especially true for substances such as PCB and DDT which are both wide-spread in the environment and slow to degrade.

The Corps has interpreted the Marine Protection, Research and Sanctuaries Act of 1972 (Act) to limit materials which have the potential to cause significant undesirable effects but not to limit the discharge of all dredged material. Further, through its reading of the Act and the Ocean Dumping Criteria (Criteria), the Corps considers designated ocean dredged material disposal sites as analogous to sanitary landfills. Thus, we accept the fact that certain limited areas defined as ocean disposal sites will be unavailable for recovery or development of other ocean resources. As with a properly designed and managed land disposal site, our primary concern is that adverse impacts (e.g. mobilization of toxic contaminants) do not manifest themselves beyond the boundary of the disposal site.

The primary concern at the moment deals with levels of PCB observed in laboratory animals subjected to dredged material using the prescribed ocean dumping bioassay procedures and the relationship that these test results have to field conditions in the New York Bight. It should be recognized that sediments from New York Harbor contain a diverse array of chemical contaminants, many with implicated human health concerns. Our New York District routinely analyzes in test organisms for DDT, cadmium, mercury, and petroleum hydrocarbons as well as for PCBs. Results have indicated that some of these other contaminants are accumulated by test organisms to varying degrees when exposed to dredged material from various projects within the New York-New Jersey Port.

Adequacy of the EPA Ocean Dumping Criteria

It is easy to sit back in 1980 and criticize the Criteria and the implementation manual for dredged material testing procedures. Since its publication, the Corps and EPA have been continuing studies on the effects of discharging dredged material. We recognize that revisions to the Criteria are needed. To this end, EPA has recently announced that the Criteria will be open for comment prior to revision.

We need to recognize that this document is in the forefront of regulatory testing procedures. As of this date, the American Society for Testing and Materials (ASTM) has yet to finalize its "Standard Practice for Evaluating the Hazard of a Substance to Aquatic Organisms" or standard practice for conducting bioconcentration tests for dissolved contaminants. ASTM has not even drafted procedures for analyzing the effects of solids discharged into the aquatic environment. Corps districts around the country have been implementing procedures similar to those proposed by ASTM since 1977. We have imposed upon ourselves some of the most sophisticated testing procedures in use for environmental regulatory programs in this country.

Do the Criteria adequately address the risk to human health? Generally, yes. Can the Criteria be improved? Definitely, yes. Any

document such as the Criteria must be dynamic. We are in a continuous learning process with regard to our knowledge of environmental effects. We have profited greatly from our experiences in the last three years. I anticipate that the next generation Criteria will be orders of magnitude better than the 1977 version.

Besides the need to clarify language and streamline procedures, I believe that the Criteria should provide clear guidance on interpreting laboratory test results, although it will have to be developed on a regional basis. I do not believe that this was an oversight on the part of the authors. Rather, at that time they lacked sufficient scientific information to assess the effects on the environment. Even today the amount of useable information on the consequences of man's assault on the coastal environment is minuscule. This was painfully evident in our attempt to develop the interpretive guidance for PCB in the New York Bight which is commonly referred to as the PCB matrix: a copy of which is supplied for the Record.

The PCB matrix is an attempt to put into writing a logical thought process, based on existing data, to interpret from test results the potential impacts that discharging PCB-laden sediments may have on the NY Bight. It too must be a living document. Since its initial drafting, we have received additional data for consideration in reviewing the matrix. More importantly, the development of the matrix has pinpointed major deficiencies in our knowledge of PCB contamination in the New York Bight and has already stimulated several research studies, including one to be conducted by Dr. O'Connor of this Panel.

I believe that a "matrix-like" concept is a useful tool which should be developed for each contaminant of concern. The Corps intends to develop interpretive guidelines for each of these contaminants as well as others that may be identified in the future as soon as discussions between the Federal agencies on the interim PCB matrix are finalized. I do not believe that the Criteria or the Implementation Manual can be expected to provide this type of information that would be applicable to the entire Nation. It must be site or region-specific.

The Criteria should define the frame-work for establishing specific interpretive guidance. Beyond this it may be beneficial to have a team of experts available to establish such documents for each region. Certainly, the experience gained from the New York Bight effort will reduce the magnitude of similar endevours in other regions.

The basic premise of the Criteria is sound. Impacts on the marine environment can best be assessed by testing for effects in marine organisms. It is also imperative that we assess the potential for transport of contaminants out of the discharge site and into commercially and/or recreationally important species, since the consumption of seafood is the mechanism by which contaminants associated with the dredged material have the greatest potential for impacting on human health.

Criteria Testing Procedures

The design of the benthic bioassay procedures used to evaluate dredged material provides information necessary to assess the potential for transport of the contaminants out of the discharge site. It requires that at least one each of a burrowing species, a deposit-feeding species and a filter-feeding species be used in the acute mortality and bioaccumulation test. The first is totally immersed in the sediment and susceptible to contamination through direct contact, interstitial water exchange and incidental to feeding. The second group demonstrates if contaminants are available through ingestion of the sediments and/or through direct exchange with the water column above the sediments. The filter-feeding species, by processing large quantities of water from near the sediment surface, indicate if soluble or particulate adsorbed contaminants are moving out of the sediments.

There are basically two routes by which contaminants can enter aquatic species: directly from the water across respiratory membranes and through the skin (bioconcentration); or by ingestion of food and incidental material (dietary intake). The process of bioconcentration plus the process of dietary intake are referred to as bioaccumulation. Another concept associated with the transport of contaminants through the biotic assemblage is biomagnification. Biomagnification is the process by which tissue concentrations of bioaccumulated contaminants increase (by multiples of whole numbers, e.g. x2, x5) as they pass up the food chain through two or more trophic levels (Macek et al., 1979: a copy of which is supplied for the Record). These three mechanisms of biotic transfer must be considered in determining the relative importance of dredged material to the overall contaminant budget.

Recent scientific studies indicate that biomagnification of PCB in lower trophic levels of the marine environment is of negligible concern when compared with direct uptake from the water column. Many of the scientists knowledgeable in the field concur with these findings. A detailed discussion of this is provided as Annex 2 of the PCB matrix document. The general consensus is that lower trophic level marine animals accumulate most of their PCB body burden by equilibrium partitioning between the animal's lipid pool and the water. In fact, dietary intake is reported to be less than the variation associated with measuring direct uptake from water (Macek et al., 1979; Narbonne, 1979).

PCB in the New York Bight

PCBs are found in the water, sediments and biota of the New York Bight. Of primary concern from a health standpoint, is the level of PCB in the edible tissue of marine animals. The FDA has established a level of 5.0 ppm wet weight as safe for consumption of seafood by humans.

There is no doubt whatsoever that PCBs are accumulated by marine animals in the N.Y. Bight (O'Connor et al., in press; Wasserman et al., 1979; Horn et al., 1979; Thomann and St. John 1979). Levels for many species have been summarized in the write-up for the PCB matrix. Concentrations of PCB as high as 16 ppm wet weight have been reported for the flesh of striped bass caught at Indian River Kilometer 122 (Hudson, NY) (Hetling et al., 1978). O'Connor et al., (in press) reported that

striped bass from open ocean environments contained concentrations of less than 1 ppm of PCB. There is no way of knowing whether these fish had been in the Hudson River, however, it is interesting to note that estimates of the length of time required to eliminate 1/2 of the animal body burden of PCB ranges from 14 to 40 days (Macek et al., 1979; Elder et al., 1979). Thus, the level of PCB in migratory fish could be reduced to below the FDA limit shortly after leaving the River. Data that we are aware of indicate that all other species in the Bight which have been analyzed for PCB body burdens, contain concentrations at least one order of magnitude below FDA standards. Furthermore, there are no apparent relationships between the concentration of PCB in animal tissue and location within the N.Y. Bight apex. In general, with the exception of the surf clam and ling (which do not appear to have a propensity for accumulating PCB), edible flesh from fish and whole body samples of invertebrates from the New York Bight apex have PCB concentrations ranging between 0.1 and 0.5 ppm wet weight (O'Connor, 1980: a copy of which is supplied for the Record). Although these concentrations are below FDA limits, the question which still must be addressed is how much of the body burden of these organisms is the result of uptake from dredged material.

Testing of N.Y. Harbor Sediments

The routine benthic bioassays currently employed by our New York District, utilize a marine worm (Nereis ssp: burrowing infauna), the grass shrimp (Palaemonetes pugio: deposit-feeder) and the clam (Mercenaria mercenaria: filter-feeder). If a contaminant is biomagnified through the lower trophic levels then bioaccumulation in the worm, which is an import food organism for first order carnivores, would indicate that a real potential exists for transport out of the discharge site and into the food web. In the case of PCB, lower level biomagnification is relatively unimportant. Therefore, uptake in and of itself in the worm is not a problem. Thus, we have established a relatively high threshold level for Nereis in the interim PCB matrix.

The grass shrimp is used to indicate if mobile organisms which pass through the discharge site will accumulate substantial levels of contaminants from the deposited material through direct ingestion of detrital material or incidental to ingestion of a prey organism. In addition, it gives us an indication of the release of dissolved contaminants into the water column.

The filter-feeding clam is used to indicate if substantial levels of biologically available contaminants are mobilized by being adsorbed to resuspended particulate matter or desorbed into the water column. Such mobilization would facilitate the transport of the contaminant out of the discharge site.

Because bioaccumulation in either the shrimp or the clam indicates the potential for mobility of contaminants, the threshold level for these organisms was set lower than for the worm, at a level suggested by Veith et al., (1979) for fish which will protect "marine life and the consumers thereof including fish-eating birds and mammals". Finally, we believe that if all three organism are accumulating PCB to a statistically significant level, a serious potential exists for causing significant undesirable effects and that the discharge of the material should be given careful scrutiny.

Continuing Studies in New York Area

The Corps is concerned about levels of contaminants in the Bight and their effects on human health and does not want to contribute to the further degradation of this coastal environment. We are continuing our efforts to evaluate the effects of dredged material discharge at the same time that we are searching for realistic alternatives for contaminated sediments. The New York District will be implementing this summer, an intensive, long-term monitoring program using the mussel Mytilus edulis to assess bioaccumulation at the discharge site and to compare it with bioaccumulation in other parts of the apex and the Harbor.

Assessment of Risk from Alternative Methods of Disposal

Personally, I believe that the assimilative capacity of the ocean must be utilized in a rational fashion. Certainly, there are many substances which should not be disposed of in the sea, however, other materials, among them most of the coastal dredged material, can be discharged into the ocean without causing significant undesirable effects on the marine community and without posing undue risk to human health.

I am concerned that many people are advocating the extensive use of upland containment sites for contaminated dredged material. The Corps has considerable experience in this field and has conducted research into the impacts of such operations. I am convinced that upland disposal will cause in many instances greater adverse effects on the human population than controlled discharge in the aquatic environment.

As Dr. Willis Peguegnat eloquently described at the recent International Ocean Dumping Symposium at Woods Hole, MA., less than one-fourth of the globe is land surface and major portions of that area are non-arable. The lands of our Nation are a precious natural resource which can only increase in value to succeeding generations. The continual dedication of vast tracts of this land for non-renewable purposes is unconscionable.

The New York Metropolitan Area is a highly populated and industrialized region. Land is at a premium. Agricultural lands, recreational areas, forested regions and general open space are vital to the well being of any human population. It is obvious that vast tracts of land will be needed to contain many of the highly contaminated wastes from this region. Sewage sludge disposal, solid waste disposal and particularly containment of hazardous wastes such as are found in Elizabeth, NJ will consume much acreage. Add to this the high initial cost of sealed containment as well as the perpetual cost for maintenance and monitoring and the potential risks to human health from groundwater leaching, runoff and volatilization, and I believe it becomes clear that low-level contaminated dredge material should not be high on the priority list for upland containment. Subaqueous containment will provide a more realistic and technically sounder approach than upland disposal.

Clean-up of Hudson River PCB-Laden Sediments

A quick reading of the Summary of Hudson River PCB Study Results (Hetling et al., 1978) will emphasize this point. It is estimated that

removal and complete confinement of remnant deposits and hot spots in the upper Hudson River (1,660,000 CY) will cost approximately 28 million dollars and require up to 175 acres of land. Removal of all River deposits with PCB concentrations greater than 1 ppm (15,000,000 CY) would require 1000 acres and cost 204 million dollars. Regarding continued maintenance of sites, the authors state:

> There is little experience with long-term operation of such facilities; and thus, there are uncertainties regarding operational costs. If no major problems occur, such costs should be minimal; however, if unforeseen problems occur, costs could be high.

Considering these problems, it is obvious that upland containment of the 7-10 million C.Y. (or even 1-2 million C.Y. assuming only 10-20 % are unacceptably contaminated) dredged annually from the New York Harbor is a major undertaking. It will require the irreversible commitment of open land and large sums of money and is fraught with uncertainties, while at the same time it will bring potentially hazardous substances closer to the human population. Certainly, some dredged material can and should be discharged upland when it can serve a useful function, however, I believe that we should dedicate our manpower, time and moneys to containing and eliminating the mismanagement of hazardous waste disposal which is unquestionably adversely affecting human health.

Projected Volumes Needed to be Dredged.

In response to the committee's request for estimated volumes of sediment which will need to be dredged in the near future, our New York District has provided the following information:

	Volume to be dredged (CY)	
	Federal	Permit
Jan 1980 - Present	0	675,180
Present - Jan 1981	1.5×10^6	122,500
1981	4.7×10^6	3.2×10^6
1982	5×10^6	3.7×10^6

In addition, within the next several years, dredging for the Earl Naval Weapons Station at Colts Neck, New Jersey may commence. This project encompassas the dredging and disposal of 11.3×10^6 CY over a four year period.

The bulk of the material discharged to date during CY 80 will be capped this summer with material which has not caused statistically significant levels of bioaccumulation in test organisms. Test results from the sediments which will be capped fall below the threshold values in the interim PCB matrix, however, because the matrix is still undergoing

technical review, it has been agreed that the material would be capped.

It is very difficult to assess the percentage of sediments that will be unacceptable for unconfined discharge. This will depend upon agreements between the Federal agencies on the acceptable level of risk associated with each contaminant. Our best estimate at this time is that 10-20 % may not meet the criteria for unconfined discharge.

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